29th Pelikan's Seminar – "Contemporary Problems of Mountain Medicine"

Conference Report

The Czech Society for Mountain Medicine and the Medical Commission of the Czech Mountaineering Association organized on 27th–28th October 2018 the traditional conference focused on mountain medicine: the 29th Pelikan's seminar. This time the event took place again in the Czech Republic, in the Liberec region, in the cottage Plan pod Jestedem.

On Friday night, before the main program, **Dr Hana Kubinova** took us virtually to Iceland in her talk accompanied by photographs and short films from traveling on this chilly Nordic island. Together with other participants of this expedition, she enjoyed ski touring and skiing down the local slopes.

The main program was launched on Saturday morning, when the introductory word was presented by **Dr Jana Kubalova**, the Chairperson of the Medical Commission of the Czech Mountaineering Association and the Vice-President of the Czech Society of Mountain Medicine. She briefly mentioned the history of these meetings and the personal story of Dr Jiri Pelikan, who tragically died in 1988 at Annapurna, and in whose honor the seminar has been held for almost 30 years. Dr Kubalova also mentioned the internationally frequently discussed topic of global warming, its effect on permafrost in the high mountains, and the related new types of accidents and challenges that are being presented to mountain rescuers.

1. The first block of lectures was dedicated to *Hypothermia and frostbites* and opened by **Dr Jana Kubalova's** lecture about **Treatment of hypothermia in the field and in the hospital.** In the overview, she mentioned the current recommendations for the triage of hypothermic patients, their treatment, focusing on specialized centers. She also presented the new scoring system HOPE for the prognosis of hypothermic patients.

2. The previous lecture was followed by **Martin Honzik, DiS**, who, after a brief theoretical introduction, presented **Case reports of hypothermic patients in the Hradec Kralove Region**. He highlighted that in the pre-hospital care some of the procedures (e.g. cold infusion, uncovering of the patient for examination, undesirable ventilation) pose a risk of further lowering of the victim's body temperature. He also presented a number of interesting cases, in which the common feature was hypothermia, often regarded as a different pathological condition. After adequate treatment of hypothermia, most patients improved without further medication. The topic raised the question of whether it is possible to enhance the management of hypothermic patients in the Czech Republic.

3. **Dr Kristina Höschlova** then continued with **Czech Mountaineers' Frostbites**. Firstly, she described the case of a man climbing Mt. Everest with oxygen, who had to be evacuated from C2 by a helicopter for total exhaustion after he successfully reach the summit. Subsequently, he was treated at a clinic in Kathmandu, where third-degree frostbites were diagnosed. The inevitable amputation was performed in the Czech Republic and coordinated by a physician with the Diploma in Mountain Medicine (DiMM). The second mountaineer spent a long time in the death zone of Nanga Parbat, where he had already noticed numbness in his toes. After his descent he was advised to rest, raise the limbs, keep the wounds clean, wear open shoes to give maximum space for good blood circulation; as a suitable sporting activity he was recommended cycling and swimming in the sea. The regeneration was quick, probably because it was a top athlete. The third climber was in the Swiss Alps at the time of the Fabienne storm. He reached the summit

of the mountain with his friend in the late hours of the day, and the circumstances forced them to spend the night in an emergency bivouac. Due to hypothermia, he was evacuated by a helicopter and transported to a hospital in Switzerland where the temperature was measured at 30° C. Besides hypothermia, he suffered from frostbites, according to the introductory photos, it was suspected to be stage 4. However, the condition changed significantly after rewarming: the classification was lowered to stage 2, which eventually passed without amputation. Dr Höschlova also mentioned the risk of hypoxia at high altitudes that makes the situation worse. Also for frostbite treatment, oxygen application and treatment in the Gamow bag are essential. Rapid evacuation is also important, preferably into a place with the opportunity of an adequate therapy, which can significantly affect the progression of the pathology. An integral part is the prevention of frostbites. In case of any doubt, it is advisable to consult any health problems in the mountains via a satellite phone.

4. **Dr Jaroslava Rihova** continued in the topic of frostbites with her **Lesson from this season's unusual number of frostbites**. After repeating the older classification of frostbites, she presented a number of interesting case reports. The first one was a man who was walking barefoot all year round and suffered the second degree frostbites during frosty winter days. The second one was an alpine tourist who suffered frostbites in the High Tatras, Slovakia. He subsequently underwent treatment in the Czech Republic, where despite the generally accepted recommendations, the surgeons in a district hospital removed the blisters. The third case was a man who suffered frostbites after a ski trip in Norway, wearing tight ski boots all day long. A local Norwegian doctor advised him to wait, not to start any recommended treatment. This story suggests taking our own first-aid kit with medicines necessary for the treatment of frostbites. Another woman became frostbitten in the High Tatras while climbing. At the surgical department in a hospital in the Czech Republic, she refused to have nectrectomy, she searched for a frostbite center herself and received there the standard treatment, including visits to the hyperbaric chamber. Dr Rihova also presented the same case from Everest as Dr Höschlova, adding some important information. For example, she added a significant anamnestic detail that the affected climber had pneumonia at the beginning of the expedition. In addition, he had technical problems with oxygen regulator, the descent from the top was very slow, for about 30 hours he was not drinking, and he was losing consciousness during the descent. Dr Rihova also mentioned newly tested substances (DMSO - dimethylsulfoxide) and increasing popularity of local remedies (Peroderm containing zinc, Panthenol, B5, A, D, E and Oils). She also pointed out that frequent complications of especially feet frostbites are fungal infections of nails, so proper treatment should be commenced accordingly.

5. After a break, **Dr Kristina Höschlova** informed us about **Education in Mountain Medicine**. Firstly, she introduced a course held in Switzerland, which is an extension course for the basic internationally recognized Diploma in Mountain Medicine (DiMM). However, this course includes a technical component besides the medical part. The participants were not only focused on providing adequate health care with regard to the conditions and the environment, but also the choice of materials for rescue, how to reach the patient with technical means, how to fixate the patient for transport and to which healthcare facility direct the patient. Participants have gained valuable experience on how to minimize technical and medical equipment so that they do not make the rescue operation and manipulation with the patient more challenging than it already is. Generally, the cornerstone of the mountain rescue is the technical evacuation outside the extreme environment. The medical treatment should be divided into two phases: first-on-site treatment should be limited to lifesaving emergency procedures (e.g. securing airway, puncture of the tension pneumothorax, large bleeding treatment and analgesia) and only after evacuation to a more appropriate environment, the second phase of the treatment

can be aimed at stabilizing the patient (e.g. introduction of IV cannula etc.). Finally, she mentioned the Mountain Medicine Course for Physicians and, as a novelty, the Mountain Medicine Course for laic Mountaineers, which had its premiere this year. Her contribution ended with the memory of Dr. Emmanuel Cauchy, who tragically died this spring under the avalanche in Chamonix.

6. The block about *Avalanches* was opened with **The Panel Discussion on 5 Issues in Avalanche Rescue**, moderated by **Dr Lenka Horakova.** It gave the audience an opportunity to participate actively in the discussion and express their opinion. Questions and answers were taken in full from a similar seminar led by an avalanche expert Dr. Hermann Brugger at the ISSW 2018 Congress in Innsbruck. The participants were gradually presented with practical scenarios from the area of avalanche rescue and they had to decide on the most appropriate procedure from one of the offered options. Then, panel of experts (Dr Kristina Höschlova, Dr Hana Kubinova, Martin Honzik, DiS, Dr Jan Pala) commented on the scenarios. Many of these situations have prompted a vivid debate.

7. After lunch, three practical **workshops** took place. The excursion at the helicopter base in Liberec gave the participants information about the spectrum of rescue operations and the pilot provided some interesting details about the helicopter type, its technical parameters, and limitations. The second option was a practical demonstration of rescue techniques in the climbing terrain, led by Martin Honzik. The last was a climbing trip with a local expert Petra Barna, who introduced participants to nearby rocks providing both sporting and traditional climbing routes.

8. After the outdoor break, a block on the topic *Trauma in the field s*tarted with **ABCDE lecture - why it is good to know the alphabet** presented by **Dr Jana Kubalova**. At first, she went through the basic algorithm for examining and treating a traumatic patient–the ABCDE approach–the main goals and the important fact that this system respects the severity and urgency of the patient's problems in order of how quickly the health issue can kill them. She also mentioned the phenomenon of a distraction injury, when less serious injuries, but shockingly looking, can distract rescuers from more important life-threatening conditions. Dr Kubalova warned that after resolving life-threatening conditions (airway obstruction, tension pneumothorax and stopping or at least limiting bleeding), it is necessary to decide transport to the correct medical facility. She also highlighted the importance of maintaining thermal comfort and the concept of the "golden hour". The evidence suggests that the number of early deaths due to continued bleeding increases significantly with the length of treatment and transport.

9. **Bleeding trauma in the mountain terrain** was the main focus of **Dr Kristina Höschlova** in her next lecture. Of the two generally accepted approaches to a traumatized patient—"scoop and run" vs. "stay and play"—it is the first one to be preferred in the case of a bleeding victim. However, this does not mean loading and transporting a patient without examining them and without treating potentially life threatening injuries. Dr Höschlova then mentioned the specifics of the ABCDE procedure in the mountain terrain and showed them on a case of a woman injured by a falling stone. For transport, care must be taken to properly fix injured parts and to provide adequate analgesia, which saves the victim energy for compensating for trauma and maintaining thermal comfort. Hypothermia and bleeding go hand in hand in the mountains. Dr Höschlova mentioned the possibility to use ultrasound in pre-hospital care (the FAST protocol). The question triggered a debate among the present emergency physicians, and there is a generally accepted opinion that this method may assist with the diagnosis but certainly should not delay transport. In addition, it is possible to postpone this examination until the time of the ambulance drive or helicopter flight. She recommends to focus on the prevention of Trauma Induced

Coagulopathy (TIC), including following measures: 1. permissive hypotension (i.e. maintaining the systolic pressure of 60–90 mmHg), 2. limiting hemodilution (up to 500 ml of crystalloids), 3. blood pressure correction if needed, vasopressors reserved for exceptional cases, 4. prevention of hypothermia by isolating and active heating. There has been a discussion about other possibilities of therapy, including indications for the administration of tranexamic acid (Exacyl), administration of fibrinogen or blood derivatives in the pre-hospital settings. Both of these methods are currently being tested in the Czech Republic.

10. The block *Snow and avalanche* was opened by Dr Jan Pala, PhD with his **New Approaches in Avalanche Prevention and Practical Outputs from the International Snow Science Workshop 2018 in Innsbruck**. As a tradition, he introduced new avalanche backpacks, specifically the Alpride E1 backpack, which uses a system of 2 capacitors that can be recharged from pencil batteries. This innovation has an undeniable advantage mainly for transport by plane. A new backpack equipped with the Avalung system has also appeared on the market, but it still carries the problem with difficult handling in case of an avalanche accident. In the field of avalanche rescue, the Recco system is regaining popularity and nowadays it is being used by more than 800 ski centers worldwide, including Serbia, Romania and Liechtenstein. In addition, advanced technologies are increasingly penetrating the avalanche area and, for example, a large number of mobile phone applications and devices are available to connect with rescue items. For example, “Resero Whistle” is a device which works through Wi-Fi or GSM, and thus it is limited to the extent of these networks. On the other hand, Gar A *Live, uses a satellite system that has better coverage in the mountain areas. Modern technologies are also used for education in avalanche prevention and rescue techniques. Pieps has come up with a training set allowing the instructor during avalanche accident training to activate and deactivate individual avalanche transceivers using the Bluetooth network. Last but not least, Dr Pala introduced the important international congress ISSW 2018 and its main topics.

11. After that, **Dr Lenka Horakova** spoke about **Avalanche research projects in the Czech Republic**. The research topics continue to address the issue of the so-called air pocket and its impact on the survival avalanche victims. This research is based on experiments with healthy volunteers who breathe into a simulated air pocket in the snow and they are continuously monitored in terms of vital signs and ventilation parameters. In previous clinical trials, it has been shown that the main benefit of the air pocket is the reduction in resistance to breathing into the snow, which significantly effects the work of breathing and therefore oxygen consumption and carbon dioxide production. The details of these experiments raised many questions from the audience. Finally, Dr Horakova introduced a questionnaire survey among the surviving avalanche victims, which is taking place in the Czech and Slovak Republic, and asked the participants to co-operate on propagation of this questionnaire, available on the website of the Czech Society of Mountain Medicine.

12. At the end of this block, **two practical scenarios** in the outdoor environment were presented. The first one demonstrated the work of a professional medical rescue team during the treatment of a man after a fall from the tree, led by **Dr Jana Kubalova**. Secondly, the same situation was solved by a lonely tourist **Martin Honzik, DiS**, who only used the contents of his own backpack and trekking poles. Still, he was able to treat the injured man in a very similar way and while waiting for the arrival of professional rescuers, he was minimizing worsening of the victim's condition and thus increasing the patient's survival chances.

13. More **practical workshops** took place before and after dinner. The trauma workshop was prepared by **Dr Jana Kubalova, Dr Hana Kubinova and Mgr. Michal Jakubu, DiS**. In small groups, participants could try a practical scenario of a bleeding trauma on the SimMan dummy; the options of controlling internal and external bleeding using simple climbing and trekking gear; they could practice removing of the climbing helmet and making an improvised traction system for femur fractures made from trekking poles. **Avalanche workshop** was prepared by **Martin Honzik, DiS, Dr Jan Pala, PhD and Petr Barna**, during which they showed unintended interference of avalanche transceivers with electronic devices, such as mobile phones and smart watches. They pointed out their appropriate and inappropriate location on the mountaineer's body. Additionally, recommendations on shovel choice and digging technique were presented, and also techniques of checking of the transceiver before going to the potentially avalanche terrain.

14. The evening program was finished by Dr Jan Pala, PhD with his interesting talk about **Ski trips from Siberia to Balkan**, accompanied by beautiful photos and exciting movies.

15. On Sunday morning, **Dr Jiri Zak** provided a whole block about **Mountains and the Law**. He first dealt with the case of a crash of a rescuer driving a four-wheeled terrain vehicle with a skier, which had unfortunately tragic consequences, including the criminal prosecution of the rescuer. He has mentioned analogous cases from the legal practice. Because this topic is connected to our everyday life, it has raised a number of questions from the audience. The second point of the seminar was criminal responsibility in sport. Climbing and alpine tourism belong amongst the riskiest sports and injuries can easily occur. By engaging in risk activity, the participant agrees to the risk. In sports, compliance with the rules of the game remains one of the cornerstones. However, mountaineering does not include rules such as ball games. The only thing we can rely on in this risky sport is the methodical guidelines available on the website of the Czech Mountaineering Association, or other relevant resources. If obeying these rules, a climber should not be held liable for any accident. The discussion with the auditorium mentioned also climbing instructors, whose behavior is governed by specific rules of the same association. The last topic was the criminal aspects of robotics. Currently, people are responsible for "robots," but there are generations of independent robots who will proceed autonomously.

16. In a similar way the last block about *Climbing accidents* was opened with a presentation about the excellent **Co-operation of helicopter rescue service of Liberec and Mountain Rescue Team from the Jizera Mountains** was presented by **Karel Kupilik**. In Liberec, the Helicopter Rescue Service was established in 1992 and, in the same year, it established the co-operation with the Mountain Rescue Service. The mountain rescuers used to be standard members of the helicopter crew and even participated in the initial training of these crews. Although a mountain rescuer is no longer a permanent member of the helicopter crew, the co-operation continues in the form of regular field workshops and operations. On average, they have 20 joint operations annually, and besides rescue s in the mountains, their frequent patients are climbers from nearby rocky areas and forestry workers. He also showed two authentic videos from these operations: the first was an evacuation of a climber from a poorly accessible terrain after a 12 m fall from a rock. The second case occurred this winter, when an ice-fall climber hit the ground after reaching the height of 5–6 m before setting his first anchor.

17. **Dr Lucie Bloudkova** in her traditional review of **Mountaineering Injuries in the Czech Republic** introduced firstly foreign methods of accident monitoring and prevention. Currently, the Czech Mountaineering Association has more than 20,000 members and especially the number of individual members is growing. However, the tracking of climbing

injuries among the members is very poor. The best sources of information on accidents are forms provided by the insurance companies. These documents contain detailed medical diagnoses, but unfortunately very few details about the circumstances of the accident itself. Another way to get information is from injuries reported via the website of the association, but unfortunately this is not a common procedure how to report an accident. The last option is so-called “open source data” from the Internet (from Facebook, climbing websites, etc.), but these resources do not provide much details either. The recorded accidents are therefore just the tip of the iceberg and in fact the injuries are much more frequent. From the available data, the youngest injured person was only 8 years old, reflecting an increase in the number of children involved in this sport. Moreover, the growing popularity of climbing gyms brings most of the accidents. Dr Bloudkova described two cases in more details. The first one happened in the Low Tatras, Slovakia, where two skialpinists died because of hypothermia. In the second one, a climber was abseiling from the first piton which became loose and caused a fall of the climber. This accident prompted a discussion regarding the legal responsibility for the climbing area and the quality of it. It has been concluded that it is important for every climber to critically evaluate the status of the climbing route before climbing it. Moreover, it is advisable to report any fault on the route to the Czech Mountaineering Association, preferably using a designated website application.

18. **Dr Jana Kubalova** subsequently presented **Accidents on the climbing wall in Brno**. In total, there were 17 incidents within over 24 000 entrances per year. She cited a German article on accidents on the climbing walls, where the calculated incidence of injuries was surprisingly very low. Dr Kubalova compared data from the German study with data from the climbing wall in Brno, which proved to be comparable. The most frequent causes of accidents are: insufficient experience, incorrect use of belaying devices, lack of attention, weight disproportion between the climbers, and incorrect or even no attachment of the harness to the rope. Another large group of injured climbers are those who perform bouldering. Typically, they suffer minor injuries such as upper limb fractures, shoulder luxations, or ankle distortions. A special case reported was a ventricular fibrillation cardiac arrest with successful by-stander resuscitation.

19. In the last presentation, **Dr Jana Kubalova** has reported **Advances in the rescue mobile application called “Zachranka”**. The project has been successful for 2 years now and is still growing—it currently has over 700,000 users. The advantage of this application is the possibility of a one-push emergency call and also the ability to locate the caller accurately. She presented map views of locations of the phone position using the application and when only the location via the mobile phone operators is used; the scattering was more than 3 km and the mobile application was proved to be much more accurate. In addition, she presented audio recordings of two phone calls from hard-to-locate injured people. Since this year, the mobile application is also connected with the Mountain Rescue Service of the Czech Republic, which should assist in rescue operations within the mountain areas. Other interesting information is also available in the application, such as interactive first aid tutorials and points of interest such as hospitals, mountain rescue stations and the location of the closest AED. The application can also alert the user about the actual dangers, such as weather problems or accidents. Into the user’s profile everyone can enter basic information like their name, allergies, or past medical history, or even some temporary information, like pregnancy, current position during vacation in the mountains, and so on. The application is available for download on iOS, Android and Windows mobile for free. This Czech application can also be used in Austria and the connection to the mountain service in Slovakia is being prepared.

Pelikan's seminar was concluded by Dr Jaroslava Rihova, who has been a regular participant since the beginning of this annual meeting. She recollected the past years, and noted that she was pleased to see the interest of young people in mountain medicine. Finally, she invited new participants to join the Czech Society of Mountain Medicine.

Finally, Dr Jana Kubalova thanked all organizers, lecturers and participants and invited them to the next, the 30th Pelikan’s seminar, which will take place on 26th-28th October 2019 in the Czech Republic again.

Written by: Dr Jana Kubalova and Dr Lenka Horakova